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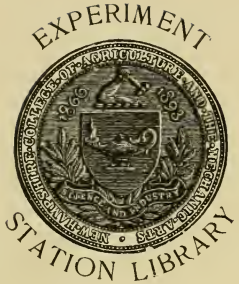

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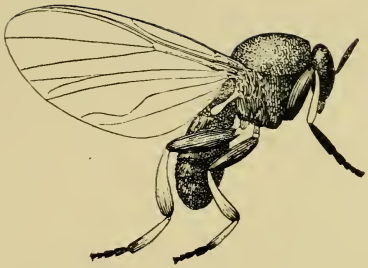

Black-fly. Greatly magnified.

EXPERIMENTS IN

DESTROYING BLACK-FLIES

BY CLARENCE M. WEED

NEW HAMPSHIRE COLLEGE
AGRICULTURAL EXPERIMENT STATION
DURHAM

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A Breeding Ground for Black-Flies.

Experiments in Destroying Black-Flies

BY CLARENCE M. WEED

In certain localities throughout a large part of the United States, black-flies are among the most annoying pests that afflict man and his domestic animals. In some of the Southern states the forms called Buffalo Gnats often cause the death of cattle, horses, and mules to an alarming extent, and at the North the attacks of the northern species are often unbearable. In some of the resort regions of New England these flies are the most vexatious pests that afflict the summer visitor as well as the resident citizen.

No successful method of exterminating these insects has heretofore been known. The only remedies that have been suggested have been various means of preventing or palliating the attacks of the adult flies. The purpose of this bulletin is to describe some successful experiments in ridding a locality of the pests through the destruction of the early stages in their breeding-places.

To understand the practical meaning of these experiments, a brief account of the life-history of these black-flies is necessary. The adult flies which annoy man by their attacks go through a series of changes during their growth somewhat similar to those which the mosquito goes through during its development. The flies lay their eggs upon the rocks in the rapids of small streams, especially at the edges of the rippling water. In a short time these eggs hatch into small larvæ that are able to spin a silken web upon the rock to hold them in place. Here they continue to develop until finally they change to pupæ, to emerge a little later as adult flies, often in such numbers that they "drive the fisherman out of the woods, tor-

ment the cattle in the pasture, and pester the farmer in the field."

This fact that the black-flies of a locality usually develop in that vicinity, and are comparatively easy to find in their breeding-grounds offers the opportunity for so reducing their numbers, if we can kill them in their breeding-places, that they will no longer be troublesome.

In the resort regions of northern New Hampshire the black-flies have long been recognized as among the most annoying pests for the summer visitors. I have had from time to time appeals from hotel managers for help in subduing the insects, but until recently have had to confess that I knew of no practical solution of the problem. For several years I have had under observation a colony of black-fly larvæ living on the flat rocks of the outlet to our college reservoir, shown in the pic-

Larva of Black-fly. Magnified.

ture on the inside cover of this bulletin, and have often tried to discover effective means of killing them.

When studying the recent literature concerning mosquito remedies, the property of Phinotas oil which leads it to sink to the bottom in water led me to think that possibly here we had an agent for destroying black-fly larvæ. In order to test the theory I sent the assistant entomologist, Mr. A. F. Conradi, in June, 1903, to Dixville Notch, New Hampshire, where these pests have for many years been especially troublesome, with specific instructions to find the breeding-places of the flies, and to try the effect of the Phinotas oil with which he was provided.

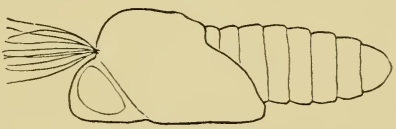
The Dixville Notch region was peculiarly favorable as to situation for an extended experiment in subduing black-flies, for it is a comparatively small area surrounded by mountains over which no flies from other localities would be likely to

come continuously. A large part of the encompassed area is taken up by a beautiful lake.

Upon his arrival Mr. Conradi made a careful survey of the entire locality, finding no flies breeding in the swiftly-running shaded streams along the mountain sides, but finding vast numbers breeding in the shallow, sunlit waters at the wasteway from the lake and in two or three other places. His notes upon the first experiment with the oil treatment are as follows:

"At the wasteway near the lake dam where the stream is approximately five feet wide, one third of a gallon of Phinotas oil was applied at 4 a. m., June 22. The effect was at once noticeable. At 2 p. m. the same day, most of the larvæ were dead, while the remainder were sluggish. On the afternoon of the next day, the conditions were carefully investigated, and all the larvæ were found to be dead, not only where the oil was applied but for ten feet or so ahead as well.

"The oil was applied by simply pouring it over a shingle, thus scattering it somewhat. It sinks and rises and lingers long about the place. Stones in the water picked up forty-eight hours after the application had a thin film of oil still on them."



Pupa of Black-fly. Magnified.

When Mr. Conradi reported the results of his trip, it seemed to me that the problem was in part at least solved, the chief perplexing feature being the possible deleterious effect upon fish of the application of the oil in quantity. From the similarity of the breeding-places he found to the one I had been observing, it occurred to me that a little work with stiff brooms in sweeping free the masses of larvæ, and then catching them down stream on wire netting stretched in the water might be helpful where the oil could not be applied. Accordingly, I sent to Dixville Notch a barrel of Phinotas oil and a supply of stiff stable brooms. When these arrived, Mr. Conradi went again with specific directions as to the use of the brooms and the application of the oil, especially, in the latter case, as to the effect upon fish life. He found that the sweeping method was entirely practicable and offered in some

breeding-grounds a simple means of destroying the pests. He also found that in a brook three feet wide where in June the flies were breeding in vast quantities, and in which he had poured one gallon of Phinotas oil, the young stages of the flies had been killed off for a distance of one eighth of a mile from the place of application. As regards fish he found that they swam rapidly down stream as soon as it was applied, and apparently were able to escape with no evil results to themselves.

Shortly after the treatment the adult black-flies became so scarce that the hotel manager discarded the smudges which for the past twelve summers had been in daily use for the protection of the guests.

The Phinotas Chemical company, New York city, furnished in the spring of 1904 two grades of oil for experimental use. One is called soluble oil, and the other is the insoluble oil used last year. On mixing with water the differences between the two are readily seen. The former mixes at once, while the latter sinks to the bottom and gradually rises. I tried both sorts in the water at the outlet to the college reservoir where the black-fly larvæ were abundant. Both appeared to be effective in killing them, but further experiments are necessary to determine which is the better. Very likely under some conditions one may be better, and under others, the other. It is probable that the insoluble oil would be less likely to injure fishes.

It is unlawful in this state to kill fish by the use of any poisonous substance. Consequently care must be taken in the use of oil against black-fly larvæ. An amendment to the law by which town authorities might exterminate the black-flies on their breeding-grounds is desirable. There need be little if any injury to fish, through an intelligent use of the oil remedy. With the sweeping method there is no danger whatever.

The common species of black-fly in New Hampshire as determined through the courtesy of Dr. L. O. Howard of the United States department of agriculture is *Simulium venustum* Say.

I believe that these experiments justify the hope that in the near future the black-fly will be more easily controlled in centres of permanent or temporary population than is the mosquito.

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